siloxane/water emulsion was then returned to the gauging water line where it mixed with the balance of the gauging water. The magnesium oxide was dry-blended with the calcined gypsum and other dry ingredients prior to the pin mixed. Except for the inclusion of siloxane and magnesium oxide in the preparation, the boards were prepared using methods and ingredients typical of prior art gypsum board production methods and ingredients. Boards were prepared with various concentrations of siloxane and various amounts of magnesium oxide and were compared with control boards and tested for water resistance in accordance with ASTM Test-1396.

TABLE 2

Gypsum Board Production Ingredients

INGREDIENT	WEIGHT
calcined gypsum	100
water	94–98
siloxane	0.4–0.8
set accelerator	1.1–1.6
starch	0.5–0.7
dispersant	0.20–0.22
paper fiber	0.5–0.7
set retarder	0.07–0.09
foaming agent	0.02–0.03
sodium trimetaphosphate (“STMP”)	0–0.016
recalcination inhibitor	0.13–0.14
magnesium oxide	0.1–0.3

In Table 2: the set accelerator comprised finely ground sugar-coated particles of calcium sulfate dehydrate, as described in U.S. Pat. No. 3,573,947, wherein the accelerator is not heated during its preparation; the starch was dry-milled acid-modified HI-BOND starch obtained commercially from Lauhoff Grain Co.; the dispersant was DILOFLO, a naphthalene sulfonate obtained commercially from GEO Specialty Chemicals of Ambler, Pennsylvania; the paper fiber was fine hammer milled paper fiber; the set retarder was VERSENEX 80, a chelating agent obtained commercially from Van Walters & Rogers of Kirkland, Washington; the foaming agent was WITCOLATE 1276, obtained commercially from Witco Corp. of Greenwich, Conn.; the sodium trimetaphosphate was supplied commercially by Astaras Co. of St. Louis, Mo.; and the recalcination inhibitor was CERELOSE 2001, a dextrose employed to reduce recalcination of board ends during drying. The siloxane was a fluid sold under the name SILRES BS-94 by Wacker-Chemie GmbH. The magnesium oxide was a dead-burned magnesium oxide sold under the name “Baymag 96” from Baymag, Inc. of Calgary, Alberta, Canada.

The boards were produced on a four foot wide continuous production line by: continuously introducing and mixing the ingredients in a mixer to form an aqueous slurry (the foaming agent was used to generate aqueous foam in a separate foam generating system; the foam was then introduced into the slurry through the mixer); continuously depositing the slurry on a paper cover sheet (face paper) on a moving belt; placing another paper cover sheet (back paper) over the deposited slurry to form ’h. inch thick board; when the hydration of the calcium sulfate hemihydrate to form calcium sulfate dihydrate proceeded far enough to make the slurry hard enough to cut precisely, cutting the moving board to make individual boards of about 12×4 feet and ½ inch thick; and drying the boards in a heated multideck kiln.

Typical moisture absorption values for such products when tested in accordance with ASTM Test 1396 are shown below in Table 3.

TABLE 3

Product	Siloxane %	MgO %	Moisture Absorbed %
Water Resistant Gypsum Board	0.8%	0.2%	4.5%
Core-Treated Gypsum Sheathing Board	.04%	0.2%	8%

Example 2

A laboratory test was run to demonstrate the effect of dead-burned magnesium oxide on the water resistance developed by a siloxane in a gypsum-based article. An emulsion was formed by mixing 0.7% of BS-94 siloxane and 550 grams of water in high shear mixer for 7500 rpm for 2.5 minutes. In tests 1-3, the emulsion was then mixed with 500 grams of a calcined natural gypsum, 0.1 grams of CSA and a selected amount of Baymag 96 magnesium oxide in a Waring Blender for 10 seconds and formed into cubes which were heated overnight. Test 4 was run in the same manner except that a calcined synthetic gypsum was used. In all tests, 0.7% by weight of the siloxane was used. The selected amount of Baymag 96 used in tests 1-4 is shown in Table 4, below. Within 24 hours of the manufacture, the cubes were immersed in water for 2 hours absorption in accordance with ASTM Test 1396 and tested for moisture. Three tests were run at each level and the average moisture level for the three tests is shown in Table 3.

TABLE 4

Test No.	MgO %	Moisture Absorbed % after 2 hours.
Control	0	47.7
1	0.05%	13.0
2	0.2%	8.6
3	0.5%	4.6
4	0.2%	3.8

The sample of test 4, made with synthetic gypsum, absorbed less moisture than the sample of test 2 made with a natural gypsum, although the same amount of Baymag 96 was used in both tests. The difference is attributed to the impurities, such as fly ash, that are typically found in synthetic gypsums.

The forms of invention shown and described herein are to be considered only as illustrative. It will be apparent to those skilled in the art that numerous modifications may be made therein without departing from the spirit of the invention and the scope of the appended claims.

We claim:

1. A method for making a water-resistant gypsum-based board comprising:

(A) mixing a siloxane emulsion with the gauging water used to prepare said gypsum-based board;

(B) mixing a small amount of dead-burned magnesium oxide with calcined gypsum, wherein the amount of magnesium oxide is from 0.1 to about 0.5 wt % of the gypsum;

(C) mixing said siloxane emulsion/gauging water mixture with said calcined gypsum/magnesium oxide mixture to form an aqueous slurry;